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COMPLETED

FLOOD INSURANCE STUDY

ORIGINAL

CITY OF GILROY, CALIFORNIA
SANTA CLARA COUNTY

FEBRUARY 1980

REVISED

SEPTEMBER 4,1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 060340

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map — Panels 060340 0001C-0004C

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Gilroy, Santa Clara County, California, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Gilroy to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Community base map selection and the identification of streams requiring detailed study were conducted in meetings on May 26, 1976 that were attended by personnel of the Santa Clara County Planning Department, Santa Clara Valley Water District, Federal Insurance Administration, and Gilroy Department of Public Works.

The following public agencies were contacted during the study to obtain basic data or information concerning this study: U.S. Army Corps of Engineers, San Francisco District; U.S. Geological Survey; State of California Department of Water Resources; State of California Department of Transportation; U.S. Soil Conservation Service; County of Santa Clara; Santa Clara Valley Water District; and City of Gilroy, Department of Public Works. Also, local engineering firms and developers were contacted regarding improvements to specific sites. The California History Center of DeAnza College, Gilroy Historical Museum, and private individuals also contributed information.

The results of this study were reviewed at a final community coordination meeting held on January 18, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the community. This study incorporates all appropriate comments, and all problems have been resolved.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by George S. Nolte Associates, for the Federal Insurance Administration, under Contract No. H-4035. This work, which was completed in January 1978, covered all significant flooding sources affecting the City of Gilroy.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Gilroy, Santa Clara County, California. The area of study is shown on the Vicinity Map (Figure 1).

Portions of streams and reaches agreed upon for study by detailed and approximate methods are as follows:

Detailed Study Reaches

Uvas Creek	Entire reach within corporate limits
Miller Slough	Entire reach within corporate limits
West Branch Llagas Creek	Entire reach within corporate limits
Lions Creek	Entire reach within corporate limits
Llagas Creek	Reach adjacent to corporate limits upstream of confluence with Miller Slough
Llagas Overbank	Entire reach within corporate limits
North Morey Creek	Entire reach within corporate limits
South Morey Creek	Entire reach within corporate limits

Approximate Study Reaches

Uvas Creek	Reach adjacent to community, from Hecker Pass Road to a point 1700 feet upstream
Llagas Creek	Reach within and adjacent to corporate limits downstream of confluence with Miller Slough
Princevalle Drain	Reach within and adjacent to corporate limits, from intersection of Princevalle Street and Thomas Road to a point 800 feet east of the South Valley Freeway (U.S. Highway 101)

Substantial development exists or is projected for major portions of Gilroy. The selection of areas for detailed and approximate methods reflects knowledge of potential or existing hazards in developed and undeveloped areas.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1983.

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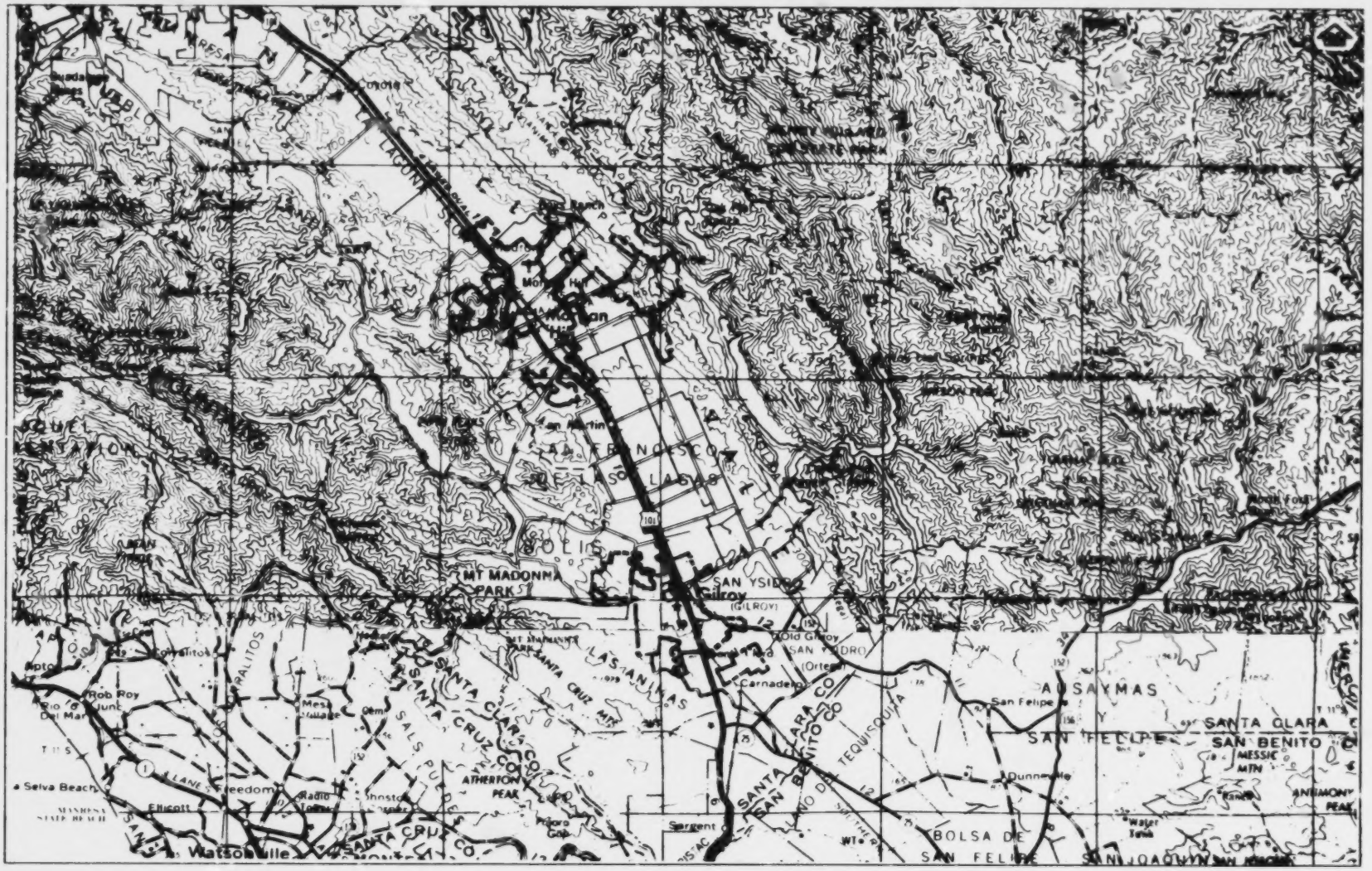
MT MADONNA PARK
Gilroy
(GILROY)
SAN YSIDRO
Old Gilroy
(SAN YSIDRO)
Carnadero
(Orteg
LAS ANIMAS
SANTA CLARA CO.
SANTA CRUZ CO.
SAN BENITO CO.
SAN FELIPE
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San Felipe
Dunneville
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ANEMONY PEAK
ATHERTON PEAK
Freedom
Elliott
Watsonville
Sargent
BOLSA DE SAN FELIPE
Rob Roy
Rio Del Mar
Aptos
Corralitos
Mesa Village
Radio Tower
Innsbruck
Water Tank
Water Tank
Rio Del Tequisquita
Rio Del Monte
Rio Del Mar
Rio Del Mar
Rio Del Mar

2.2 Community Description

Gilroy is located in southern Santa Clara County, in west central California, at the foot of the Santa Cruz and Diablo Mountain Ranges. The city, encompassing an area slightly in excess of 6 square miles, extends from the foothills outward onto the alluvial plain of the Santa Clara Valley. Gilroy is approximately 75 miles south of San Francisco, 20 miles south of central San Jose, and 18 miles east of Watsonville and the Pacific Ocean. Gilroy is the only city in the county which does not have a common border with other municipalities; it is completely surrounded by unincorporated areas of Santa Clara County. The city's nearest neighbor is Morgan Hill, 10 miles to the north.

Prehistorically, the region that would ultimately become Gilroy was inhabited by Indians of the Costanoan group. The designation Costanoan is from the Spanish, Costanos, or coast people (Reference 1). The descendants of these indigenous peoples preferred the name Ohlone, "people of the west," which was given to them by the Yokuts, the Indian group living to the east in the San Joaquin Valley (Reference 2). The Ohlone lived within the watershed lands from the Carquinez Straits on the north to the Carmel River on the south. Their eastern boundary was the interior chain of the coast ranges, the Mount Diablo Mountain Range. Thus, their territory included not only all of Santa Clara County, but what is now San Francisco, San Mateo, Contra Costa, Alameda, San Benito, Santa Cruz, and Monterey Counties. Probably no more than 10,000 Ohlone Indians were living in this large domain at any one time (Reference 1).

Recorded history began in the Gilroy area with the coming of the Spanish. During the latter half of the 18th century, several Spanish expeditions were sent north from Mexico to strengthen Spain's hold on the Californias. In 1769, Gaspar de Portola led a party north along the California coast. Having passed Monterey Bay, and not recognizing it, Portola's expedition camped a few days at Point San Pedro. Two of his men, who were hunting for food, climbed the northeastern hills. From the summit, they looked down on "a valley like a great inland sea, stretching northward and southeastward as far as the eye could reach" (Reference 3). These were the first Europeans to see the Santa Clara Valley; the date was November 2, 1796. In March 1776, Captain Juan Bautista de Anza passed through what is now Santa Clara County during the expedition which ultimately selected the sight for the City of San Francisco. The California missions were subsequently established, laying the foundation for Spanish influence in the area.

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In 1821, Mexico gained independence--an event with far reaching consequences for all of California. The missions were secularized, and, under Mexican law, private citizens could petition for lands previously belonging to the missions. Hundreds of large land grants were created throughout the territory. American interest in California increased steadily, and Mexico and the United States went to war. Mexico had little chance in this dispute, and, with the Treaty of Guadalupe Hidalgo in 1848, it surrendered all of the California territory to the United States.

In what is now the Gilroy area, the first land grant in the Santa Clara Valley was created. The rancho known as Las Animas (The Souls) was granted to Mariano Castro in 1802 (Reference 4). This large tract, covering 26,518 acres, was centered in what is now the City of Gilroy. Subsequent grants involved the lands which surround Gilroy. In 1809, the east and northeast portions of rancho Las Animas were split off in the creation of San Ysidro, a grant given to Ygnacio Ortega. In 1834, Mariano Castro acquired additional lands. Rancho Solis, covering 8875 acres between Gilroy and Mount Madonna, was added to his holdings. In 1834, Carlos Castro was granted rancho San Francisco de las Llagas (St. Francis of the Wounds), covering 22,283 acres between Gilroy and Morgan Hill. In that same year, Manuel Jimeno Casarin was granted rancho Salsipuedes ("get out if you can"), 31,201 acres straddling the Santa Clara-San Cruz County line west of Gilroy. Finally, in 1843, Juan Perez Pacheco and Jose Maria Mejia were granted title to rancho San Luis Gonzaga, a giant 48,827-acre tract east of Gilroy, running almost to Los Banos (Reference 4).

At this same time, American pioneers were beginning to penetrate the area. Gilroy owes its name to John Gilroy, a Scottish sailor and the first permanent non-Spanish settler in California. In 1814, Gilroy was left ashore in Monterey by the Hudson's Bay vessel Isaac Todd because he was suffering from scurvy. He settled in the southern portion of the Santa Clara Valley, where he married Maria Clara Ortega, a grantee of part of the San Ysidro land grant. The settlement which developed on the rancho became known as San Ysidro, and later as Gilroy. After the coming of the railroad, in 1869, the name Gilroy was firmly established (Reference 5).

The livestock and grain, fruit, and vegetable crops which launched Gilroy as a farm service community still remain the dominant sector in the economy of the area. Unlike the northern portions of the county, which have changed from agricultural to technical/industrial centers, the southern part of the county is still a very viable food-producing area. The pressures of population growth in San Jose, and improved access to Gilroy by the completion of the South Valley Freeway, is expected gradually to increase the population and industrial growth of the area. However, the 1985 General

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Plan for Gilroy preserves large tracts of land surrounding the city for agricultural use. Thus, for the foreseeable future, agriculture will remain a major element in the local economy.

Gilroy has experienced a much more even development history than cities in the northern portion of the county. Incorporated in 1868, Gilroy had a population of 1625 by 1870. In 1960, Gilroy's population had increased to only 7348 (Reference 6). Thus, the post World War II boom--which radically altered northern portions of the county between 1945 and 1960--had little effect in Gilroy. However, the pattern of growth in Gilroy is beginning to follow countywide trends. The special census conducted in April 1966 showed Gilroy to have a population of 10,253. In 1976, the population of the city was estimated at 17,000. "As the San Jose area becomes more heavily urbanized, it is forecast that pressures will increase on the south county and Gilroy to house people seeking the economic and environmental advantages of suburban living" (Reference 6).

At the present time, Gilroy still serves as a farm implement center and the hub of a very active agricultural area. As the largest city between San Jose and Salinas--situated approximately 20 miles from each of these cities at the crossroads of State Highway 152 and U.S. Highway 101--Gilroy occupies a central location in the southern part of the county. The commercial activities of the city are still centered along Monterey Street, formerly the route of U.S. Highway 101. The construction of the South Valley Freeway (U.S. Highway 101), which runs parallel to and east of Monterey Highway, has alleviated the severe traffic problems which plagued the downtown area. Monterey Street has been turned into a semi-mall and continues as the center of the downtown area. "The Downtown has been defined in the General Plan as the area bounded by First Street on the north, the Southern Pacific Railroad tracks on the east, Tenth Street on the south, and Church Street on the west" (Reference 6). Most commercial development in Gilroy is contained within this area.

The older residential area of the city is located west of the downtown section described above. It is defined on the west by Princevalle Street. Additional residential development is located further west, off Hecker Pass Highway (State Highway 152). Further residential development will probably continue to be located primarily west and north of the downtown area.

Industrial development in Gilroy is located to the east of the downtown area. Future development is expected to follow this general configuration. The area between Monterey Street and the new South Valley Freeway is slated for industrial use. The Southern Pacific Railroad tracks are located between these two thoroughfares, providing rail service to industrial activities in the

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area. A continuous, narrow band of industrial uses is planned along the eastern edge of the freeway bypass "...to place a buffer between the agricultural land and urban development. It is hoped that this will further discourage expansion of residential uses into the agricultural lands east of the freeway" (Reference 6). The remaining lands to the northwest, east, and southeast of Gilroy are to remain in active agricultural use.

Gilroy is linked with communities to the north and south by Monterey Highway. This highway follows the historic route of El Camino Real; formerly, it ran directly through the center of Gilroy. Monterey Street was the main road and simultaneously the highway. This situation was changed by the completion of a segment of the South Valley Freeway (U.S. Highway 101). This highway runs parallel to and east of Monterey Street, intersecting Monterey Highway south of the downtown area. Gilroy is connected with Watsonville to the west and Los Banos to the east by State Highway 152. This road is noted for its passes on either side of Gilroy (Hecker Pass over Mount Madonna to Watsonville, and Pacheco Pass toward the east to Los Banos).

Major arterials within the city running parallel to Monterey Street include Murray, Forest, and Alexander Streets to the east, and Eigleberry, Church, Rosanna, Hanna, Carmel, and Princevalle Streets to the west. The major streets running perpendicular to Monterey Street include Leavesley Road and First through Tenth Streets.

The City of Gilroy is served by rail; the Southern Pacific Railroad mainline runs through town, parallel to and between Monterey Street and the South Valley Freeway. San Jose Metropolitan Airport is located approximately 25 miles to the north via U.S. Highway 101. The South County Airport, a general aviation facility, is located in San Martin, approximately 5 miles to the north, also via U.S. Highway 101.

Gilroy is situated on a flat alluvial plain which lies between the Santa Cruz and Diablo Mountain Ranges. It forms part of the southern Santa Clara Valley floor. The majority of the city consists of basically level terrain; toward the east and west this gives way to rolling foothills. These foothill areas in turn become steeper, graduating into the mountain ranges which flank Gilroy. San Francisco Bay and the San Jose metropolitan area are to the north; the Salinas Valley is to the south. The elevations in Gilroy range from 160 feet to 400 feet. The slope of the land is toward the south.

The climate of Gilroy is characterized by warm, dry summers, and cool, moist winters. Periodically, in the summer, the temperature may rise above 100°F, and, although the winters are generally mild, temperatures may drop below 20°F for short periods of time.

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Because of the greater distance of Gilroy from San Francisco Bay, there is a greater variance in the temperature of Gilroy than in the northern portions of the county.

In its early days, Gilroy was recognized for its beneficial climate, which still exists today; its fruit growing prowess attests to the general mildness of the weather. Annual precipitation in the area averages approximately 20 inches, although some years have recorded greater than 35 inches. Most of the annual precipitation, approximately 98 percent, occurs during the period from October through May. Violent thunderstorms, snowfall, and other extreme weather conditions are rare.

The soils in the Gilroy area are rich, alluvial deposits suitable for growing numerous crops. Erosion of the Diablo Mountain Range to the east and the Santa Cruz Mountain Range to the west has been the source of the soils which now form the alluvial plain upon which Gilroy rests. To the west, the San Andreas Fault extends through the Santa Cruz Mountain Range, which is crossed by rift zones and fracture lines. Meandering creeks that have their headwaters in the surrounding mountains cross the foothills and the flat, alluvial portions of Gilroy. The soils which have been deposited in the area are from the most recent epoch of geological history, the Pleistocene. The alluvial and sedimentary deposits consist of alternating layers of loam, clay, gravel, and sand, and various mixtures of each.

The vegetation in Gilroy is varied. The foothills are covered with a wide range of trees, including some redwoods, and thick brush cover. The valley floor features oak, eucalyptus, and varieties of fruit trees. Numerous cultivated trees and plants (including citrus) flourish throughout the city, thus attesting to the extraordinary climate of Gilroy.

The principal watercourses in Gilroy are Llagas and Uvas-Carnadero Creeks. The Uvas-Carnadero Creek system is approximately 26 miles long, with its headwaters in the Santa Cruz Mountain Range. The system flows generally southeast to join the Pajano River approximate 6 miles south of Gilroy (Reference 6).

Drainageways in Gilroy are a combination of natural channels (creek beds) and channels altered by man. Runoff originating in the city drains to these channels through an underground storm drainage system. The general drainage pattern in Gilroy is ultimately conveyed to Monterey Bay via the Pajaro River.

All surface water originating in, or passing through Gilroy, ultimately discharges into the Pacific Ocean at Monterey Bay after entering the Pajaro River at the Santa Clara-San Benito County line.

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2.3 Principal Flood Problems

Information on flooding of the Uvas-Carnadero and Llagas Creeks covers the years from 1889 through 1973. During this period, the Gilroy area experienced floods of varying severity.

Flooding in early years was often viewed as an asset rather than a liability. The need for water to irrigate agricultural crops outweighed the damage done by floodwaters. In later years, as development increased, damage became a more important consideration. In addition, completion of the Uvas Dam in 1955 altered the profile of potential flooding.

The following are descriptions of major floods in Gilroy: The severity of the floods and the relative development of the area vary from year to year. Accordingly, the damage resulting from these floods reflects the prevailing conditions. The 1955 flood was the flood of record in Gilroy, and damage was greatest in that year. Other years marked by serious flood conditions were 1914, 1937, 1963, and 1969.

Some of the earliest accounts of flooding in the Gilroy area occur in the year 1889. As reported in the December 10th issue of the San Jose Morning Daily Times, the conditions were as follows:

> Gilroy, December 9- The damage resulting from the overflow of the levees and adjacent creeks are inconsiderable, although causing much inconvenience to the owners...Probably $2000 will cover the entire losses. From the county districts no particular damages are reported, although the roadmasters will be in demand to make the bridges and mountain roads safe (Reference 7).

As was the case with the vast majority of Santa Clara County at the time, the rural/agricultural nature of the area precluded heavy damage from floodwaters.

The next appreciable flooding came to Gilroy 17 years later. The Gilroy Dispatch, in January 19, 1906, carried a description of the flooding.

> Rain commenced on Thursday January 11th about 4 o'clock and by 8 o'clock Sunday morning there had been a fall of 6.70 inches as recorded by Mr. G.W. Wentz. On Saturday evening the Uvas Creek, some distance to the west of the town, had overflowed its banks and the water was flowing down Seventh Street. There was nothing very alarming as the water was flowing very quietly along...By midnight the water began to subside and by daylight had passed away without having done any damage (Reference 8).

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The flood conditions of January 1914 were considerably more severe than in previous years. The Gilroy Dispatch of January 3rd declared, "Waters of Uvas Creek, swollen by unprecedented rainfall, rush into town, flooding stores and washing away fences on both sides of town from Fifth Street south" (Reference 9). Greater development of the downtown area accounted for the increased damage.

> The waters spread south from Fifth Street, to the Carnadero bridge, there being from 1 to 2 feet of water on Monterey Street between Fifth and Seventh Streets. Stores were flooded causing much damage... This was by far the worst flood in the history of the town (Reference 9).

The winter storms of 1931-32 were well received in the Gilroy area. As noted in the Gilroy Advocate of January 1, 1932,

> California has been blessed with a record rainfall during the past week, and the storm instead of being the worst, is about the best Christmas present that could have been given, after an unusually long dry spell which has now lasted several years. Many sections have been flooded, but the good that has resulted far outweighs the damage (Reference 10).

Heavy precipitation affected the watercourses on both sides of the valley. The Gilroy Advocate article noted that "Unusually heavy rains have been falling in the eastern hills, which has caused the Coyote to flood many ranches in the lower valley...The Uvas and Llagas are flowing for the first time in two years, and the Uvas broke over its bank near the Ellsworth Eustice place..." (Reference 10).

Damage in the central section of town was not a factor during this flood.

> The flooding of the area south of town was what saved Gilroy from a real flood. The farmers were a bit inconvenienced, but were joyful to see their land receive a thorough soaking. Ellsworth Eustice reported that the water around his residence measured approximate 14 inches (Reference 10).

Additional areas in Gilroy experienced flooding, but again, the accounts suggested no appreciable damage.

> The area east of the Southern Pacific tracks, and near the Gilroy High School was a miniature sea, and boats were the order of the day. The damage in that area, however, was not serious (Reference 10).

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The storm of mid-December 1937 brought record breaking rainfall to the Gilroy area. As reported in the Gilroy Advocate of December 11, "The Hotel Milias gauge readings from 7 a.m. Thursday to 9 a.m. Saturday gives a grand total of 9.67 inches for the 50-hour period" (Reference 11). This exceptional precipitation was accompanied by significant flooding.

> Not only did Gilroy experience its heaviest rain in 23 years Thursday and Friday, but it devastatingly and damagingly suffered its worst flood conditions in the same period too, when an additional 3 inches of rain fell in the past 24 hours and the Uvas Creek overflowed. The overflow of the Uvas Creek levee west of town...sent a 2-foot wall of swirling, yellow, muddy water over most of the westside residential section, especially between 6th and 7th Streets (Reference 11).

The outlying areas received even heavier precipitation. "The flood waters of the Uvas Creek section, with over 15 inches of rain in that area in the past 48 hours...lashed at the twin bridges on the Hecker Pass Highway until they cracked under the pressure and they too went out" (Reference 11). The underpass at Morgan Hill also was flooded and U.S. Highway 101 was covered with water for several miles north and south of Gilroy.

The area affected by the floodwaters from this storm was extremely large. "Northeast of town, where Gilroyans usually suffer most from flood conditions, it was estimated ten square miles of land were under water at the height of the inundation" (Reference 11). This flooding in 1937 was the most severe until the flood of record, which occurred in December 1955.

On February 1 and 2, 1945, Gilroy had 3.31 inches of rain during 24 hours. The resulting floodwaters, although not as severe as those of 1937, caused significant damage. The following report appeared in the February 3rd issue of the San Jose Mercury Herald:

> Llagas Creek surged through the C.B. Gentry Dehydrating Co. plant on Pacheco Pass, Gilroy, forcing a suspension of operations in most departments. One flood casualty resulted when Florence Stayton, a Gentry bookkeeper, slipped on the flood-drenched floor and suffered a broken arm. She was treated at the Wheeler Hospital... Three miles west of Gilroy, waters of Carnadero Creek boiled over Hecker Pass Highway at the twin bridges, with consequent damage to that section (Reference 12).

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As previously noted, the storms of December 16 through 28, 1955, produced the flood of record in the Gilroy area. The heaviest precipitation occurred during the 3-day period ending December 23. The 12.9 inches of rain reported in the Gilroy area resulted in the Uvas and Carnadero Creeks creating a flow of 14,000 cubic feet per second at U.S. Highway 101. The following reports of the damage are from the Gilroy Evening Dispatch and Gilroy Advocate (week of December 26-30):

> Last week's floodwater entered at least 82 homes in the Gilroy area, according to an on-the-spot check made by Red Cross officials...In Gilroy itself, the points hardest hit were the Walnut Park loop on Forest Street and a few homes on East Sixth Street near the east city limits...
>
> The greatest number of homes invaded by the churning water of Thursday night and Friday were those in the Carnardero Creek flooded area around Highway 101 from the south city limits to the San Benito County line. The Red Cross found 20 damaged homes in that section.
>
> Ten homes in the Walnut Park tract were damaged when two drainage ditches running south in the field east of Forest Street took the shortcut to Miller's Slough. The east Sixth Street district had 4 homes with water on the floors.
>
> The Red Cross listed these other homes damaged: Ten on Bolsa Road, two on Bloomfield Road, seven on Mesa Road, three on Forest Street, five on Leavesley Road, two on Hecker Pass Road, two on the Crum tract north of Gilroy; and a total of 12 on Kern, Wren, and Tatum north of First Street (Reference 13).

Completion of the Uvas Dam, in 1957, was a contributing factor in holding down flood levels in the Gilroy area during the April storms of 1958. Alviso and other areas within Santa Clara County suffered extensive damage from rampaging floodwaters during this storm, but Gilroy proper was not appreciably affected. South of town, however, conditions were more severe. As recorded in the San Jose Mercury of April 3, 1958,

> The Bolsa district south of Gilroy took one of the heaviest blows in Santa Clara County. There the waters of the Carnadero Creek covered hundreds of acres of farm land with a sheet of water up to two feet deep (Reference 14).

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Miller Slough was the principal flood problem in January 1963. The headline in the Friday, February 1 issue of the Gilroy Dispatch read. "Miller Slough Runs Wild". A rainfall of 3.21 inches during 24 hours caused severe flooding of Forest Street, Church Street, and Sixth Street, with all of the water flowing from Miller Slough. The Church Street bridge was completely under water and the Walnut Lane tract was flooded. Thirty people were evacuated from the Crum Tract section of town. "The families were rescued from their water-filled homes by members of the sheriff's department" (Reference 15). North of town "...Chris's Fine Food suffered extensive mud and water damage...Water was as high as 30 inches inside the premises and set a new waterline high" (Reference 15). However, the scope of this flood, and the resulting damages, were far below 1937 and 1955 levels.

Mild flooding occurred in the Gilroy area in January 1968. The Uvas and Llagas Creeks did not overflow their banks, but flooding did occur on Carnadero Creek. As noted in the Gilroy Dispatch of February 1,

> Floodwaters roared down Carnadero Creek...cutting a 10-foot swath from the Miller Road crossing near Christmas Hill Park. Barricades have been replaced at both approaches to the creek, cutting the heavy flow of traffic down Miller Avenue to Gavilan College... City officials expect the crossing to be closed until late spring (Reference 16). No other damage was reported as a result of this storm.

Miller Slough was again a source of extensive floodwaters in January 1969. As reported in the January 10 issue of the Gilroy Dispatch,

> Leaden skies this weekend dumped 5 inches of rain into already swollen Miller Slough, causing it to rush over its banks and flood several sections of town.
>
> Some 35 persons were evacuated from trailers in the Wagon Wheel Mobile Village on Murray Avenue, where water rose to four feet in some areas of the trailer park (Reference 17).

Damage was not confined to this area alone. Auto dealerships on North Monterey Street suffered broken windows caused by the waves which were created by heavy trucks moving through the 3 feet of water standing in the street. The area around the high school was also affected. "The steady stream of water into I.O.O.F. Avenue swept down Forest Street where Miller Slough had left its banks and filled the intersection at Walnut Lane with 3 feet of water" (Reference 17).

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Carnadero Creek flooded as it had in 1968. "The Miller Avenue Crossing was blocked to traffic...when the Carnadero Creek swept over the roadway, removing recently installed culverts (Reference 17).

The winter of 1972-1973 produced high levels of precipitation in Gilroy. The rains in January and February 1973 were steady, however, and did not create local flood conditions. Although some areas of Santa Clara County did experience mild levels of flooding during this winter, Gilroy was spared.

Photographs of past floods in Gilroy are shown in Figures 2 through 8.

2.4 Flood Protection Measures

Federal and local flood control projects have provided drainage or reservoir projects which affect flood damages in the City of Gilroy.

Llagas Creek, from immediately south of Buena Vista Avenue to Pacheco Pass Road, was realigned and improved to provide barrow material for the recently completed South Valley Freeway through the City of Gilroy. This work was done in conformance with the proposed channel improvements and bridge reconstruction planned for Uvas Creek as part of the Watershed Protection and Flood Protection Act (Public Law 566).

The Ronan Channel, partially complete with respect to construction of bridges, was built to intercept floodwaters north of the City of Gilroy. Initial work on the Ronan Channel was done to provide barrow material for the South Valley Freeway. With the exception of a project sponsored by the City of Gilroy to divert some flow from West Branch Llagas Creek by lengthening the Ronan Channel and adding a 60-inch culvert at Monterey Highway, the Ronan Channel has not significantly relieved the potential flooding through Gilroy. Ronan Channel construction and improvement are part of the Public Law 566 program.

Improvements along Uvas Creek through the City of Gilroy have been carried out primarily by local developers in conjunction with the Santa Clara Valley Water District and the City of Gilroy, Department of Public Works. The north levee of Uvas Creek has been strengthened from Miller Avenue to a point 3500 feet upstream. A U.S. Army Corps of Engineers levee improvement project for the north bank between Thomas Road and Miller Avenue is in the planning stage.

Other local improvements have consisted of bridge and culvert construction and, in some cases, are not adequate to contain the 100-year floodflows.

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Figure 2. Flooding From Miller Slough at Intersection of I.O.O.F. Avenue and Forest Street, December 1931 (Courtesy of Gilroy Historical Museum)

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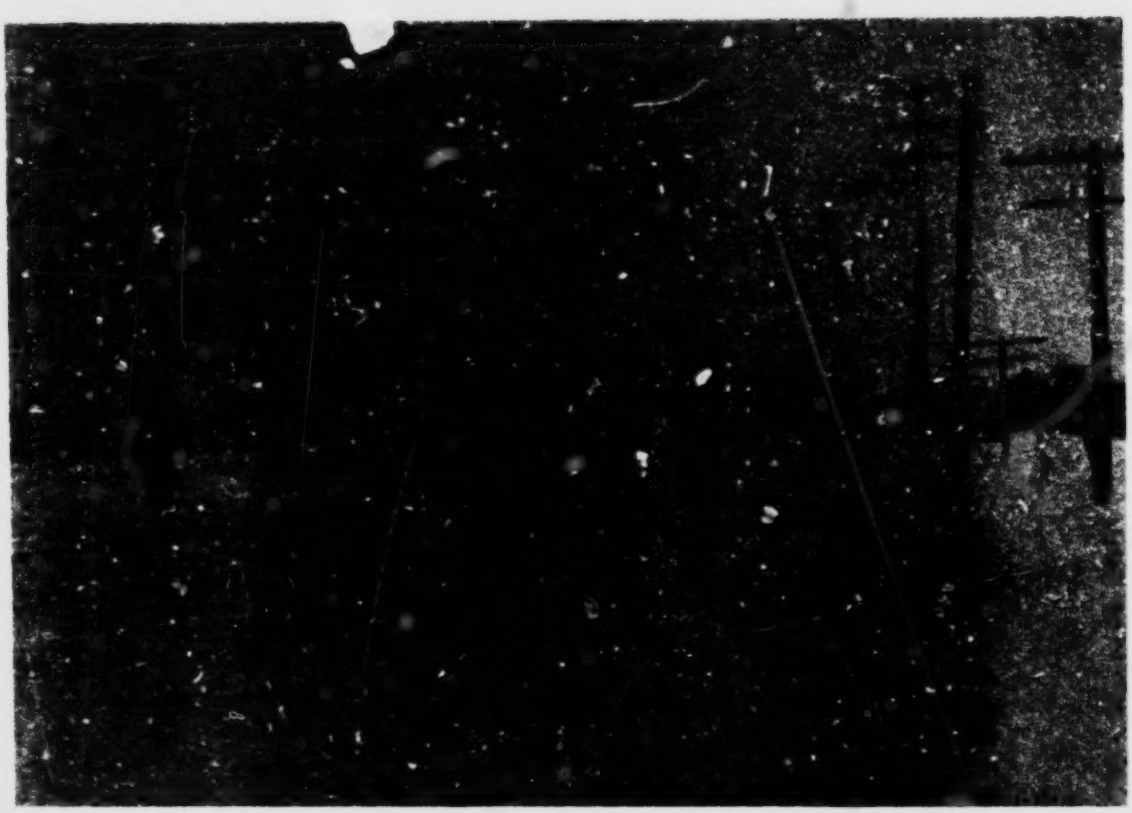

Figure 3. Monterey Highway in Gilroy, Looking North, December 1955 (Courtesy of Gilroy Historical Museum)

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Figure 4. Thomas Road at Monterey Highway, Looking West, December 1955 (Courtesy of Loma Prieta Resource Conservation District, U.S. Soil Conservation Service)

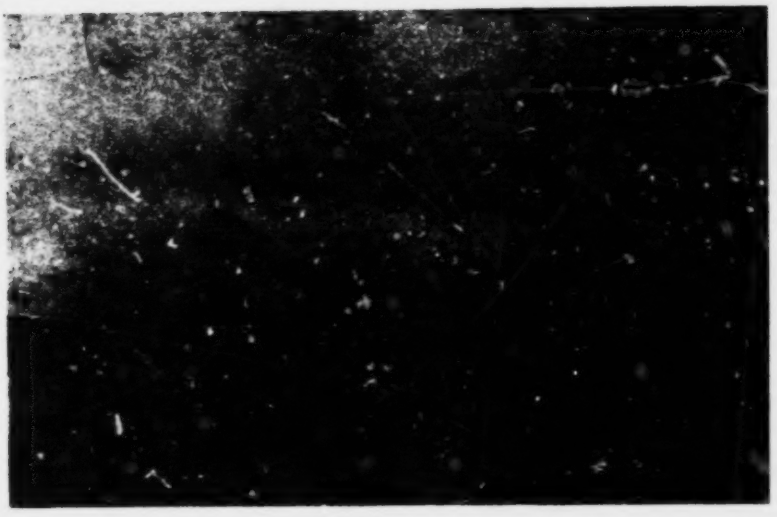

Figure 5. Llagas Creek at Bloomfield Road, Looking East, April 1958 (Courtesy Loma Prieta Resource Conservation District, U.S. Soil Conservation Service)

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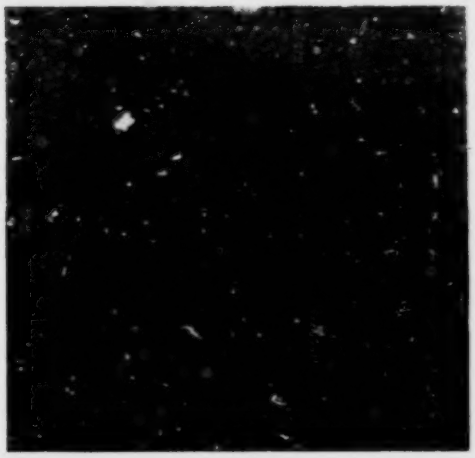

Figure 6. West Branch Llagas Creek at Highland Avenue in Area of Approximate Study, Looking Downstream, January 20, 1969 (Courtesy Loma Prieta Resource Conservation District, U.S. Soil Conservation Service)

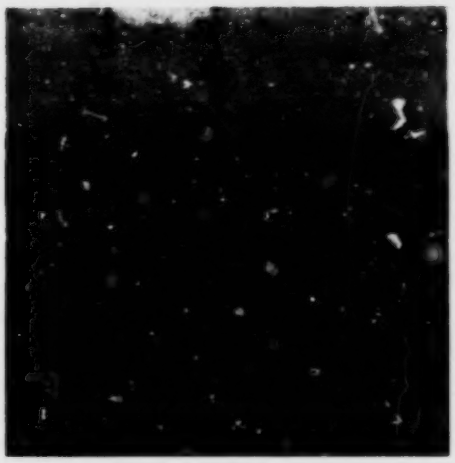

Figure 7. Flooding From Lions Creek at Intersection of Wren and Ronan Avenues, Looking East, January 20, 1969 (Courtesy Loma Prieta Resource Conservation District, U.S. Soil Conservation Service)

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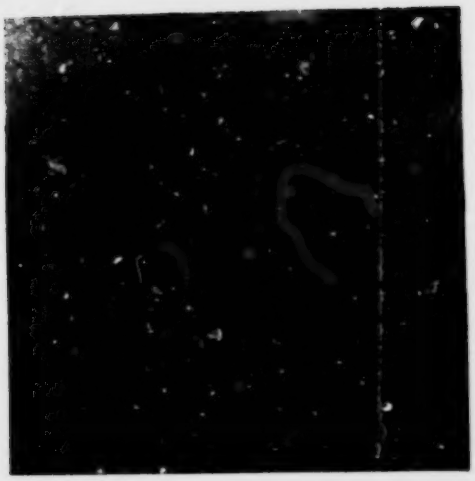

Figure 8. Miller Slough at Gilman Road, Looking North, January 20, 1969 (Courtesy Loma Prieta Resource Conservation District, U.S. Soil Conservation Service)

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3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1 and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

Flood hydrographs and peak flow rates for the 10-, 50-, 100-, and 500-year floods for streams studied by detailed procedures were based on rainfall-runoff computations and regional regression equations developed by the Santa Clara Valley Water District (Reference 18).

The regional regression equations are based on the frequency statistics of the records of 20 stream gages in Santa Clara County and surrounding area. The parameters used in the regional regression equation consist of the drainage area of the basin, mean annual precipitation, characteristic drainage lengths of the basin, and slope of the main drainage course of the basin. With these parameters, the statistics of the peak flow rate and 24-hour flow volume can be determined through use of the regression equations.

Drainage areas were broken down into smaller subbasins. The HEC-1 computer program (Reference 19) was used with the Santa Clara Valley Water District 24-hour storm pattern and storm depth to produce subbasin hydrographs. For rural areas, the hydrographs were balanced using HEC-1 to reflect both the peak flow rate and

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24-hour volume as predicted by the regional regression equations. For urban areas, the hydrographs were based on runoff coefficients from the Santa Clara Valley Water District Urban Hydrology Methodology (Reference 20). Actual storm drain capacities were included for routing these hydrographs.

The effects of channel and valley (overbank) storage on floodflow rates were determined by developing storage-discharge relationships for reaches of each stream. In detailed study reaches, the storage-discharge relationships were developed by computing a series of water-surface profiles for various flow rates and determining the storage in the reach for each outflow rate. Flood hydrographs from the smaller subbasins were combined and routed downstream using the Modified Puls routing procedure. For reaches outside of the limits of detailed study, storage-discharge relationships were generally obtained from normal depth computations.

Uvas and Chesbro Reservoirs, with capacities of 10,000 and 8,090 ac -feet, respectively, provide the only regulation on Uvas and Llagas Creeks. The principal function of the reservoirs is water supply. The dams were not constructed for flood-control purposes. However, Uvas Reservoir does provide an incidental flood-control benefit.

Modified Puls routings were performed for each of the recurrence intervals. An appropriate starting reservoir level for each recurrence interval was determined by a coincidental frequency analysis which was performed by the Santa Clara Valley Water District.

Four stream gages in the area were considered to possess an adequate record: Bodfish Creek (1960-1975), Coyote Creek near Gilroy (1961-1975), Uvas Creek above the reservoir (1962-1975), and Uvas Creek at Morgan Hill (1931-1957). These records were analyzed by the log-Pearson Type III method of analysis (Reference 21) and included in the stations used to develop the regional regression equations.

Peak discharge-drainage area relationships for Lions, Llagas, Miller Slough, North Morey, South Morey, Uvas, and West Branch Llagas Creeks are shown in Table 1.

The attenuation caused by Uvas Reservoir is the reason the peak flow rates for Uvas Creek decrease with increase in drainage area below the dam. Flow rates on Miller Slough at the Southern Pacific Railroad and Uvas Creek below Thomas Road decrease due to a channel capacity restriction. The resulting channel overflows were routed with normal depth computations.

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Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Lions Creek					
Upstream of West Branch Llagas Creek	2.6	400	800	940	1,200
Llagas Creek					
Downstream of Live Oak Creek	63.7	5,500[1]	9,700[1]	9,800[1]	10,300[1]
Downstream of Leavesley Road	67.0	5,200[1]	5,200[1]	5,200[1]	5,200[1]
At Ronan Channel	84.8	7,400	12,900[1]	13,800[1]	21,400[1]
Downstream of Princevalle Drain	87.7	7,600	10,700[1]	11,000[1]	11,200[1]
At Bloomfield Road	103.6	8,300	13,600	14,800	23,300
Miller Slough					
Downstream of West Branch Llagas Creek	11.0	1,700	2,700	3,000	3,700
At Southern Pacific Railroad	11.5	1,700	2,700	3,000	3,700
At U.S. Highway 101	15.5	2,300	3,200	3,400	3,900
North Morey Creek					
Upstream of Lions Creek	1.0	210	300	340	420
South Morey Creek					
Upstream of Lions Creek	1.3	260	360	400	500
Uvas Creek					
Downstream of Hecker Pass Road	65.1	5,500	11,500[1]	13,600[1]	19,100[1]
At U.S. Highway 101	71.6	5,700	8,300[1]	8,300[1]	8,300[1]
West Branch Llagas Creek					
Upstream of Colden Gate Avenue	5.6	950[1]	1,350	1,500	1,900[1]
Upstream of Miller Slough	6.1	930[1]	1,370	1,500	1,650[1]

[1]Decrease in flow with increase in area is result of spill.

Flood hydrographs for streams studied by approximate methods were calculated only when required to complete the detailed study analysis. Relative flood magnitudes for other streams studied by approximate methods were based on historic information, existing hydrologic analyses, available watershed information, and field observations.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in the community.

Flood elevations were computed through the use of the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (Reference 22) and supplemented by hand calculations where required.

Elevations for streams studied by approximate methods were determined based on historic information, existing reports (Reference 5), and field observation.

Limited areas of Gilroy are subject to sheet flow; that is, shallow overland flooding that is generally less than 3 feet deep and characterized by unpredictable flow paths. The water-surface elevations of flooding in these areas are essentially independent of those along the adjacent streamway and are affected principally by obstructions in the flooded area.

Cross sections for backwater analysis were located at small intervals upstream and downstream from bridges and culverts and other hydraulically significant features in order to establish the backwater effect of such structures in areas that are urbanized or potentially subject to development. All bridges and culverts were measured to determine channel geometries at flow restrictions. Topographic data for channel cross sections were obtained from existing plans and topographic mapping, supplemented with aerial photogrammetric and field survey data as necessary (References 23 through 30).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness factors (Manning's "n") for the hydraulic computations were assigned on the basis of field inspection of flood plain areas. Specific creeks and roughness factors are listed in the following table:

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Flooding Source	Roughness Values: Channel	Overbank
Lions Creek	0.025	0.030 to 0.080
Llagas Creek and Llagas Overbank	0.025 to 0.040	0.025 to 0.050
Miller Slough	0.025 to 0.050	0.025 to 0.080
North and South Morey Creeks	0.020 to 0.030	0.022 to 0.035
Uvas Creek	0.030 to 0.050	0.025 to 0.045
West Branch Llagas Creek	0.025	0.020 to 0.060

It should be added that, due to the perched condition of Llagas Creek below Rucker and a low swale between Llagas Creek and U.S. Highway 101, this area was modeled separately. Llagas Creek channel was modeled as usual but all overflow to the west was added to the Llagas overflow (Llagas Overbank). Large areas and significant flooding depths made it necessary to draw profiles, delineate zones and determine base flood elevations for this overflow area. A unique situation arises near the confluence of Ronan Channel and Llagas Creek. High backwater upstream of State Highway 152 in Llagas Creek and lower water-surface elevations in the overflow area causes reverse flow up to the Ronan Channel and down the old Miller Slough.

Starting water-surface elevations for Llagas Creek and Uvas Creek were computed using normal depth analysis downstream of the detailed study reach. Starting water-surface elevations for Miller Slough were taken from its confluence with the Ronan Channel/Llagas Creek Overbank. The West Branch Llagas Creek and Lions Creek starting water-surface elevations were taken from their respective confluence points with Miller Slough. North and South Morey Creeks starting water-surface elevations were taken from their respective confluence points with Lions Creek. Llagas Overbank starting water-surface elevations were taken from its confluence point with Llagas Creek.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

In addition, it should be noted that the only flooding from the Llagas Creek which affects the City of Gilroy is 500-year flooding. This is in the extreme eastern portion of Gilroy in the area adjacent to the creek between Pacheco Pass Highway and the corporate limits.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

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4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:1200, with a contour interval of 2 feet (Reference 23), and aerial photogrammetric maps (References 24 through 30).

Flood boundaries for creeks studied by approximate methods were established based on engineering judgment, taking into account flood elevations estimated from available data, existing hydrologic and hydraulic analyses, and field observations.

Areas subject to sheet flow flooding were delineated using surveyed and photogrammetric elevations, field investigations by experienced engineers, and hand calaculations based on normal depths. Areas where overflow from channels, or where runoff in excess of storm drain capacity would collect and pond were evaluated as part of the sheet flow flooding investigations.

In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown.

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in

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flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodway developed for this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

Floodway limits were always calculated to be at or inside the 100-year flood plain limits. This resulted in some floodway limits being located within the banks of the existing channels. These types of floodway limits must be regarded as a minimum criteria as considerations of velocities of flow and the slopes of banks could often yield a more prudent setback to allow for bank sloughing.

Unlike typical floodway cross sections shown in Figure 9, a portion of the channels in Gilroy have no overbank areas that allow a continuous water-surface across the channel and the overbanks. In general, overbank areas are lower than the bank elevations so that once water overtops the channel banks, it flows along its own path as sheet flow. The following describes the floodways in Gilroy:

Licns Creek

Upstream of the confluence with the North Morey Creek, the floodway was based on the method of equal conveyance reduction. Downstream of this confluence, the floodway was set at the flood plain limits. Any encroachment in the downstream area would result in a break in the floodway, with floodwaters being transferred to West Branch Llagas Creek.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
LIONS CREEK								
A	150[1]	275	640	2.6	206.5	206.5	207.2	0.7
B	650[1]	425	1,180	1.4	206.7	206.7	207.5	0.8
C	1,315[1]	480	1,050	1.6	206.8	206.8	207.7	0.9
D	1,740[1]	185	480	2.6	206.8	206.8	207.8	1.0
LLAGAS CREEK								
A	16,130[2]	70	800	8.1	174.3	174.3	175.2	0.9
B	16,845[2]	85	1,030	6.3	175.7	175.7	176.7	1.0
LLAGAS OVERBANK								
A	3,590[3]	430[4]	1,040	7.5	172.4	172.4	172.8	0.4
B	4,315[3]	500[4]	1,790	3.6	174.4	174.4	175.3	0.9
C	5,010[3]	335[4]	1,330	4.9	175.4	175.4	176.1	0.7
D	5,690[3]	600	1,430	4.5	177.0	177.0	177.6	0.6
E	6,165[3]	1,120[4]	6,870	0.9	182.1	182.1	183.1	1.0
F	6,690[3]	855[4]	5,040	1.3	182.1	182.1	183.1	1.0
G	7,430[3]	850[4]	5,750	1.2	182.2	182.2	183.2	1.0
H	8,235[3]	995[4]	3,370	2.0	182.4	182.4	183.3	0.9
I	8,980[3]	600[4]	1,600	4.2	183.1	183.1	184.0	0.9
J	9,775[3]	895[4]	1,780	2.7	185.3	185.3	186.2	0.9
K	10,380[3]	785[4]	1,310	3.7	186.4	186.4	187.3	0.9
L	11,030[3]	895[4]	3,080	1.5	188.8	188.8	189.5	0.7
M	11,880[3]	600[4]	980	4.7	189.4	189.4	190.0	0.6
N	12,400[3]	575[4]	1,390	3.3	190.8	190.8	191.5	0.7
O	13,855[3]	620[4]	1,270	3.7	193.1	193.1	194.0	0.9
P	15,250[3]	680[4]	1,600	2.9	195.3	195.3	196.0	0.7
Q	17,555[3]	475[4]	1,475	3.2	196.6	196.6	197.5	0.9
R	18,085[3]	690[4]	1,890	2.5	197.5	197.5	198.3	0.8
S	18,810[3]	600[4]	3,380	1.4	199.6	199.6	200.4	0.8

[1]Feet Above Confluence With Miller Slough
[2]Feet Above Confluence With Pajaro River
[3]Feet Above Confluence With Llagas Creek
[4]Floodway Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

FLOODWAY DATA

LIONS CREEK-LLAGAS CREEK-LLAGAS OVERBANK

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
NORTH MOREY CREEK								
A	537[1]	35	60	6.5	207.0	207.0	207.4	0.4
B	1,203[1]	40[2]	170	2.3	210.9	210.9	211.3	0.4
C	1,630[1]	20	70	5.6	210.9	210.0	211.2	0.3
D	2,095[1]	55	110	3.5	211.5	211.5	212.2	0.7
E	2,825[1]	50	100	3.9	212.6	212.6	213.4	0.8
F	3,490[1]	115	130	2.6	213.2	213.2	214.2	1.0
SOUTH MOREY CREEK								
A	893[1]	20	70	5.7	208.1	208.1	209.0	0.9
B	1,337[1]	20	70	5.7	209.3	209.3	210.0	0.7
UVAS CREEK								
A	11,895[3]	150[4]	1,570	9.1	205.8	205.8	206.1	0.3
B	12,640[3]	175[4]	1,870	7.6	207.6	207.6	207.8	0.2
C	13,580[3]	160[4]	1,620	8.8	208.5	208.5	208.9	0.4
D	14,190[3]	105[4]	1,300	11.0	209.6	209.6	209.9	0.3
E	14,675[3]	225[4]	2,530	5.6	211.8	211.8	212.0	0.2
F	15,415[3]	225	3,370	4.2	212.5	212.5	212.8	0.3
G	16,045[3]	320	4,070	3.5	212.7	212.7	213.0	0.3
H	16,905[3]	315	5,040	2.8	212.9	212.9	213.2	0.3
I	17,375[3]	335[4]	3,690	3.8	213.1	213.1	213.5	0.4
J	17,805[3]	265[4]	3,230	4.3	213.2	213.2	213.6	0.4
K	18,195[3]	220[4]	3,070	4.6	213.3	213.3	213.8	0.5
L	18,800[3]	360[4]	5,280	2.7	213.7	213.7	214.2	0.5
M	19,475[3]	430[4]	7,830	1.8	213.8	213.8	214.3	0.5
N	20,275[3]	355[4]	6,980	2.0	213.8	213.8	214.3	0.5
O	21,100[3]	375[4]	4,020	3.5	213.9	213.9	214.3	0.4
P	21,730[3]	445[4]	6,100	2.3	214.0	214.0	214.6	0.6

[1]Feet Above Confluence With Lions Creek
[2]Floodway Lies Entirely Outside Corporate Limits
[3]Feet Above Monterey Highway (U.S. Highway 101)
[4]This Width Extends Beyond Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

FLOODWAY DATA

NORTH MOREY CREEK-SOUTH MOREY CREEK-UVAS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
WEST BRANCH LLAGAS CREEK								
A	620	520	790	1.9	206.5	206.5	206.6	0.1
B	1,550	510 [2]	1,000	1.5	207.6	207.6	208.4	0.8
C	2,150	510 [3]	770	1.9	209.6	209.6	210.4	0.8
D	2,880	220 [2]	310	4.8	210.6	210.6	211.3	0.7
E	3,965	235 [2]	540	2.8	213.9	213.9	214.5	0.6
F	4,745	245 [3]	520	2.9	215.7	215.7	216.5	0.8
G	5,340	415 [3]	780	1.9	216.4	216.4	217.1	0.7
H	6,320	335 [3]	370	4.1	218.6	218.6	219.4	0.8
I	7,295	315 [3]	660	2.3	221.2	221.2	222.1	0.9
J	7,785	315 [3]	340	4.4	222.5	222.5	222.9	0.4
K	8,460	170 [3]	290	5.2	224.3	224.3	224.9	0.6
L	9,310	145 [3]	520	2.9	225.9	225.9	226.8	0.9
M	10,020	145 [3]	330	4.5	223.2	228.2	229.0	0.8
N	10,935	200	630	2.4	230.6	230.6	231.6	1.0

[1] Feet Above Confluence With Miller Slough
[2] This Width Extends Beyond Corporate Limits
[3] Floodway Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

FLOODWAY DATA

WEST BRANCH LLAGAS CREEK

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Miller Slough

Miller Slough is an undersized channel that cuts through the plains of an alluvial valley running through a rather densely developed section of the City of Gilroy. Floodways were found not to be applicable for Miller Slough. Unlike the typical cross section shown in the Floodway Schematic, the cross sections along Miller Slough will not allow a continuous water surface across the channel and adjoining overbanks. Two overbank conditions generally exist:

1. The overbanks may be level with the top of the channel bank and only after the cross section is extended from 200 to 300 feet beyond the channel does it begin to slope away from the channel.

2. The channel banks are perched from floodwaters overtopping the banks and depositing sediment, with overbanks sloping away from the channel.

These topographic conditions result in sheet flow areas caused by the channel overflows and a separate water surface within the channel. Forcing floodwaters to stay within the channel banks during the 100-year flood by placing encroachments parallel to the channel causes flooding problems which did not exist prior to the designation of the floodway. In addition, most of the overbank areas are developed with many structures either along or close to the channel. Filling in the gaps between these existing structures would augment downstream overflows and could cause new overflows.

Because of the existing development, undersized channel capacity, and inadequate carrying capacity in a reasonable floodway width, floodways are not applicable for Miller Slough.

North and South Morey Creeks

The floodways for the North and South Morey Creeks were generally determined by the method of equal conveyance reduction. In areas of perched channel, the floodways were placed at the limits of that portion of the 100-year flood plain where there was a continuous water surface across the channel and adjoining overbanks. Because the floodway prevented the stream to stream interchange of floodwaters, the flow rates used in floodway determinations were different from those used in flood plain delineations.

Upstream of the study limit on South Morey Creek, it was not possible to contain the total flow rate with a rise in water surface of 1 foot or less. An overflow across Morey Avenue was the result.

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Ronan Channel

The floodway for Ronan Channel is defined by the channel banks because the channel is designed to contain the 100-year flow.

Uvas Creek

Floodways for Uvas Creek upstream of Thomas Road were determined by equal conveyance reduction methods except where limited by channel banks. Downstream of Thomas Road, the channel capacity falls well below that necessary to convey the 100-year flood, and extensive overtopping of the existing levee occurs. The significant shallow flooding of areas adjacent to Uvas Creek downstream of Thomas Road are the result of a spill over the south bank immediately upstream of Monterey Highway and numerous spills over the north bank between Thomas Road and Monterey Highway.

Floodways for Uvas Creek from 1100 feet downstream of Thomas Road to the end of study at Monterey Highway were not applicable under Federal Insurance Administration standards. However, raising of the water-surface elevation downstream of Thomas Road through construction of a levee or extensive filling for development would cause overtopping of the levee upstream of Thomas Road. Overtopping of the channel upstream of Thomas Road has the potential to cause new flooding problems and/or increase the severity of existing problems due to building location and density.

West Branch Llagas Creek

The floodway for West Branch Llagas Creek is generally based on the method of equal conveyance reduction. This method was used upstream of the high mounds which are north of the lake in Los Animas Park. Downstream of this point, the westerly floodway was set at the west bank of the channel and there was no easterly limit. This unique situation is caused by the high mounds acting as barriers to the flow and necessitates that the floodway be discontinuous near the lake. The discontinuity results in a spillage of floodwaters from the floodway on West Branch Llagas Creek into the floodplain for Miller Slough.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood boundaries are close together, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 9.

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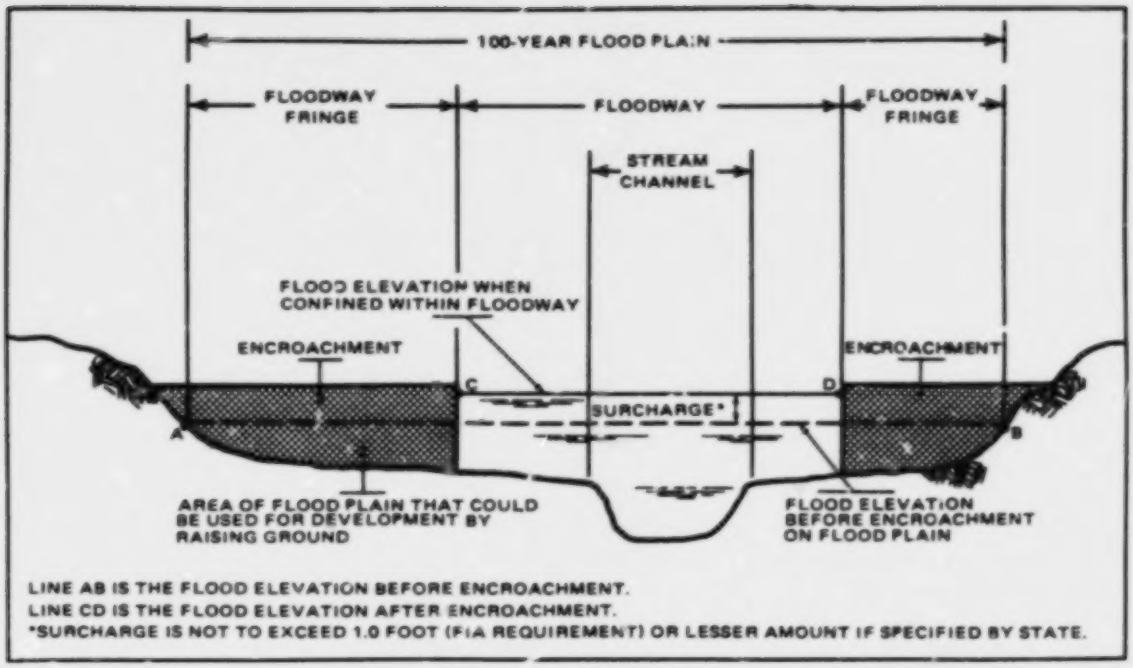
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 9. Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Gilroy.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Lions Creek							
Reach 1	0001	-0.6	-0.2	0.2	005	A1	Varies - See Map
Llagas Creek							
Reach 1[4]	0004	-0.7	-0.2	0.3	005	A1	Varies - See Map
Llagas Overbank							
Reach 1	0004	-1.7	-0.2	1.0	015	A3	Varies - See Map
Reach 2	0004	-2.1	-0.1	0.9	020	A4	Varies - See Map
Reach 3	0002	-1.1	-0.1	0.8	010	A2	Varies - See Map
Miller Slough							
Reach 1	0002	-0.7	-0.1	0.1	005	A1	Varies - See Map
Reach 2	0001,0002	-2.2	0.0	0.1	020	A4	Varies - See Map
Reach 3	0001	-0.9	0.0	0.0	010	A2	Varies - See Map
Sheet Flow Area	0001,0002	N/A	N/A	N/A	N/A	A0	Depth 1
North Morey Creek							
Reach 1	0001	-0.5	-0.1	0.1	005	A1	Varies - See Map
South Morey Creek							
Reach 1	0001	-0.2	0.0	0.1	005	A1	Varies - See Map
Uvas Creek							
Reach 1	0001,0003	-6.1	-1.2	0.9	060	A12	Varies - See Map
Sheet Flow Area	0004	N/A	N/A	N/A	N/A	A0	Depth 1
Ponding	0004	N/A	N/A	N/A	N/A	AH	188
Ponding	0004	N/A	N/A	N/A	N/A	AH	190

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot [4]100-Year Flooding Outside Corporate Limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

FLOOD INSURANCE ZONE DATA

LIONS CREEK-LLAGAS CREEK-LLAGAS OVERBANK-MILLER SLOUGH-NORTH MOREY CREEK-SOUTH MOREY CREEK-UVAS CREEK

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Uvas Creek (continued)							
Ponding	0004	N/A	N/A	N/A	N/A	AH	191
West Branch Llagas Creek							
Reach 1	0001	0.0	0.0	0.1	005	A1	Varies - See Map
Sheet Flow Area	0001	N/A	N/A	N/A	N/A	AO	Depth 1
Ponding Area	0002	N/A	N/A	N/A	N/A	AH	198
Ponding Area	0004	N/A	N/A	N/A	N/A	AH	189

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

FLOOD INSURANCE ZONE DATA

UVAS CREEK-WEST BRANCH LLAGAS CREEK

Flood plains and water-surface profiles for Uvas Creek were published for a Flood Plain Information Study done by the U.S. Army Corps of Engineers in 1973 (Reference 5). Differences resulted from changes in channel sections due to active quarrying, and changes in flow rates were due to incidental storage levels in Uvas Reservoir.

Coordination efforts for floodflow values and drainage areas for the community of Morgan Hill involved four separate agencies: U.S. Army Corps of Engineers, U.S. Soil Conservation Service, U.S. Geological Survey, and Santa Clara Valley Water District. No agency objected to routed flow values as determined for existing conditions for this Study.

This Study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this Study can be obtained by contacting the Office of the Director, Insurance and Mitigation Division, Federal Emergency Management Agency, 211 Main Street, Room 220, San Francisco, California 94105.

8.0 BIBLIOGRAPHY AND REFERENCES

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25. Harl Pugh and Associates, Photogrammetrically Digitized Cross Sections, Miller Slough, Confluence With Ronan Channel to Confluence With West Branch Llagas Creek, Scale 1:6,000, March 10, 1977.

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26. ----------, Photogrammetrically Digitized Cross Sections, Morey Creeks, Confluence With Lions Creek to Morey Avenue, Scale 1:6,000, March 10, 1977.

27. U.S. Department of the Army, Corps of Engineers, San Francisco District, Computer Model Prepared Using Digitized Cross Sections, Uvas Creek, Confluence With Pajaro River to Uvas Reservoir.

28. Harl Pugh and Associates, Photogrammetrically Digitized Cross Sections, Lions Creek, Confluence With Miller Slough to 400 Feet Upstream of Tatum Avenue, Scale 1:6,000, March 10, 1977.

29. ----------, Photogrammetrically Digitized Cross Section, Uvas-Cardanero Creek, Miller Avenue to Hecker Pass Highway, Scale 1:12,000, Photographed October 28, 1976.

30. ----------, Photogrammetrically Digitized Cross Section, West Branch Llagas Creek, Confluence With Miller Slough to 4,000 Feet Upstream of Day Road, Scale 1:6,000, Photographed March 10, 1977.

31. Federal Emergency Management Agency, Federal Insurance Administration, Flood Hazard Boundary Maps, City of Gilroy, California, Scale 1:12,000, May 31, 1974 (revised June 4, 1976).

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9.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at the Planning Department for the City of Gilroy, 7351 Roseanna Street, Gilroy, California 95020.

9.1 First Revision

This study was revised September 4, 1987, to add approximate Zone A flooding along Uvas Creek for an area located west of Thomas Road to the Southern Pacific Railroad. The flood boundaries were delineated from information provided by the City of Gilroy based on the February 1986 flood.

Zone B flood designations south of Uvas Creek were changed to Zone D designations based on better topographic data.

The corporate limits for the City of Gilroy were revised to reflect recent annexations.

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FLOOD PROFILES

LIONS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

01P

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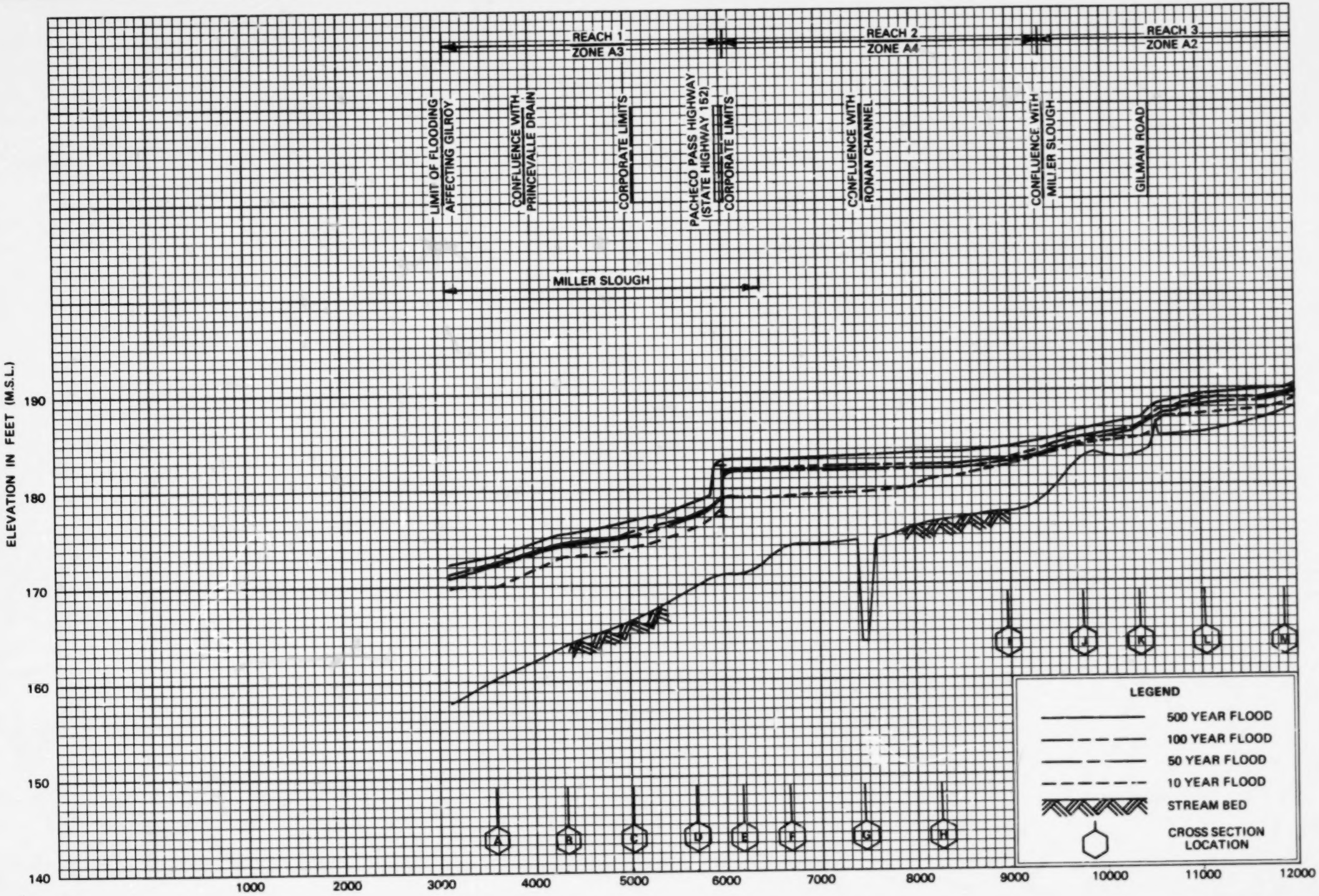

FLOOD PROFILES

LLAGAS OVERBANK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

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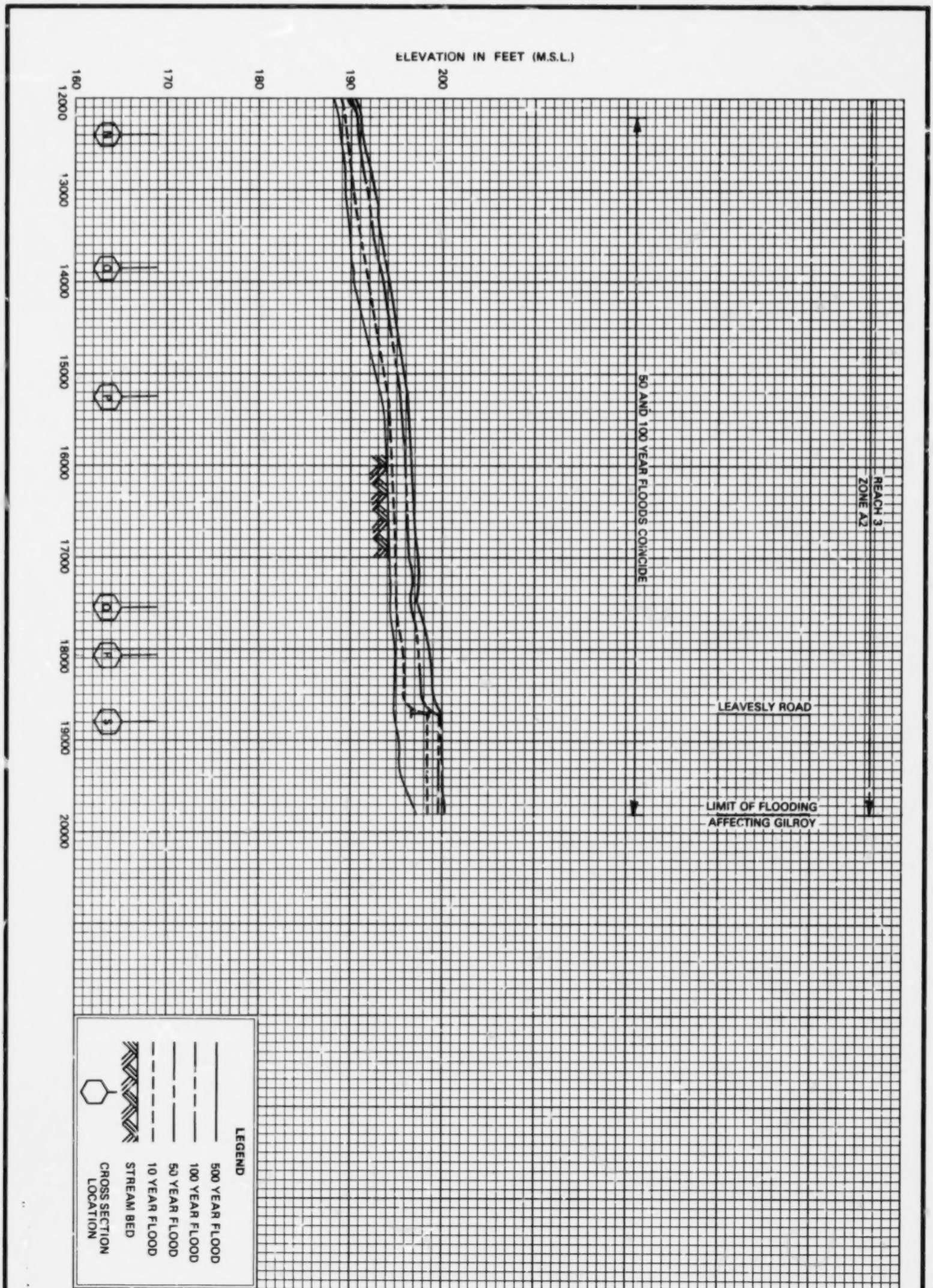

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FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

FLOOD PROFILES

LLAGAS OVERBANK

41

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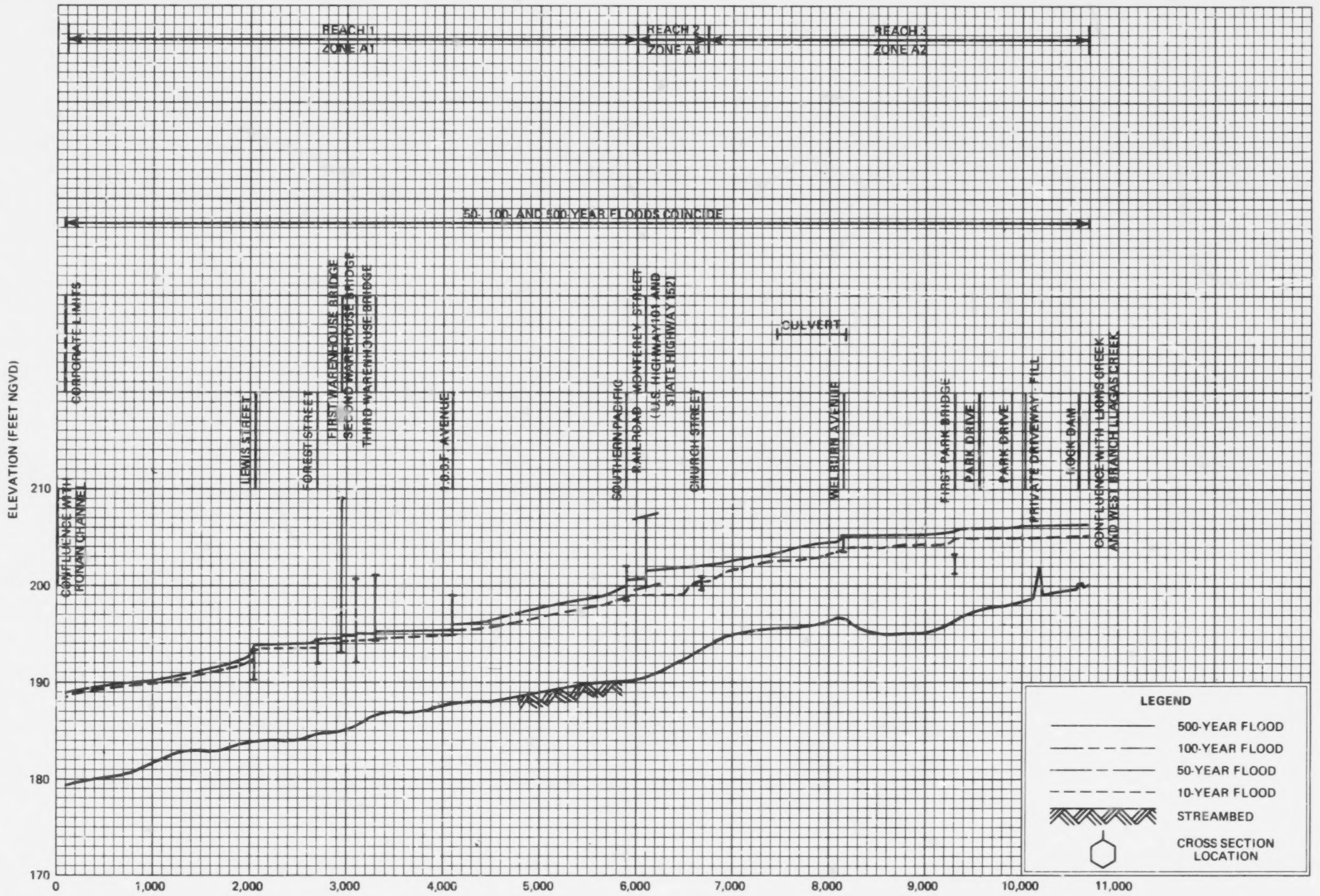

FLOOD PROFILES

MILLER SLOUGH

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

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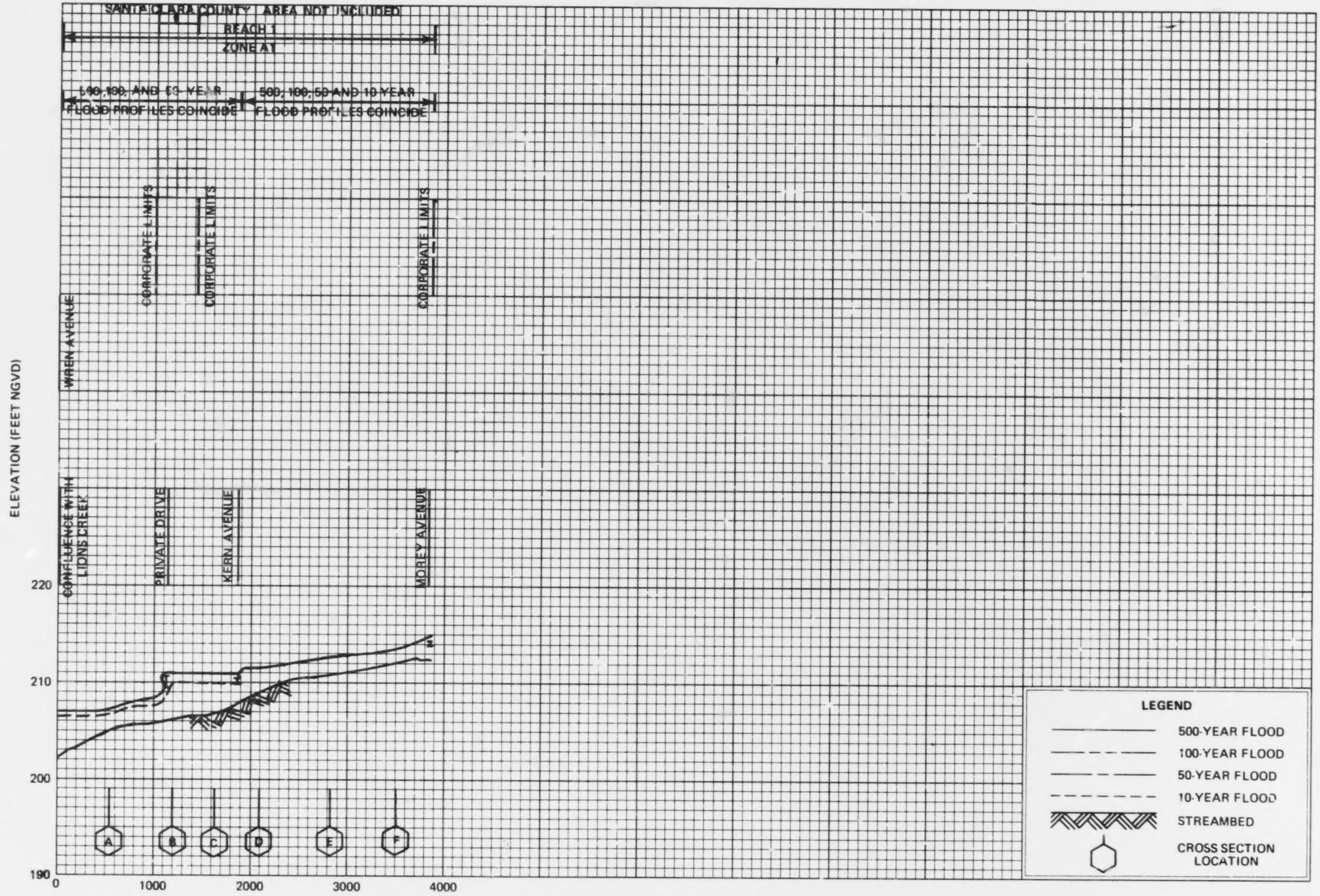

FLOOD PROFILES

NORTH MOREY CREEK

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Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

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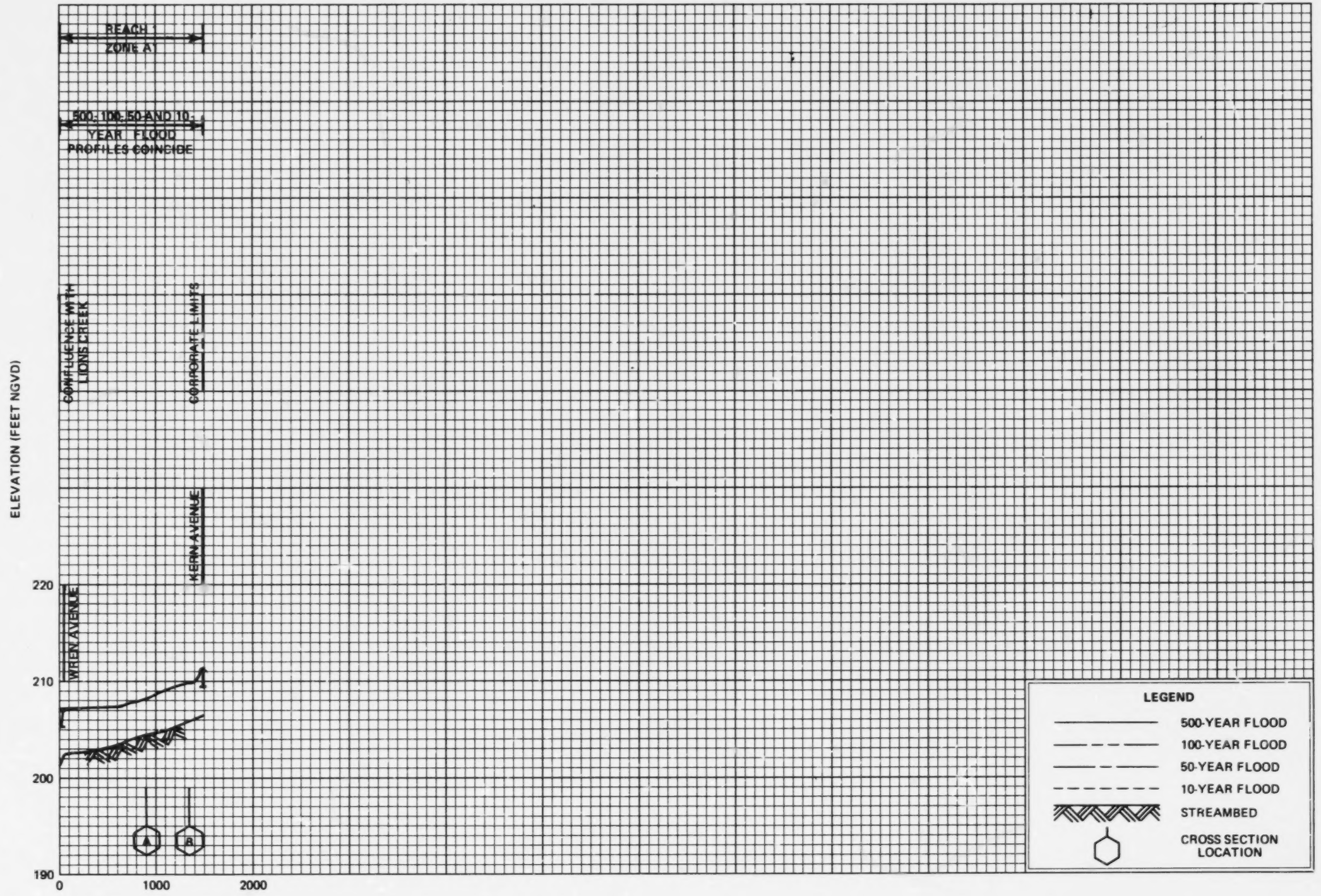

FLOOD PROFILES

SOUTH MOREY CREEK

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CITY OF GILROY, CA
(SANTA CLARA CO.)

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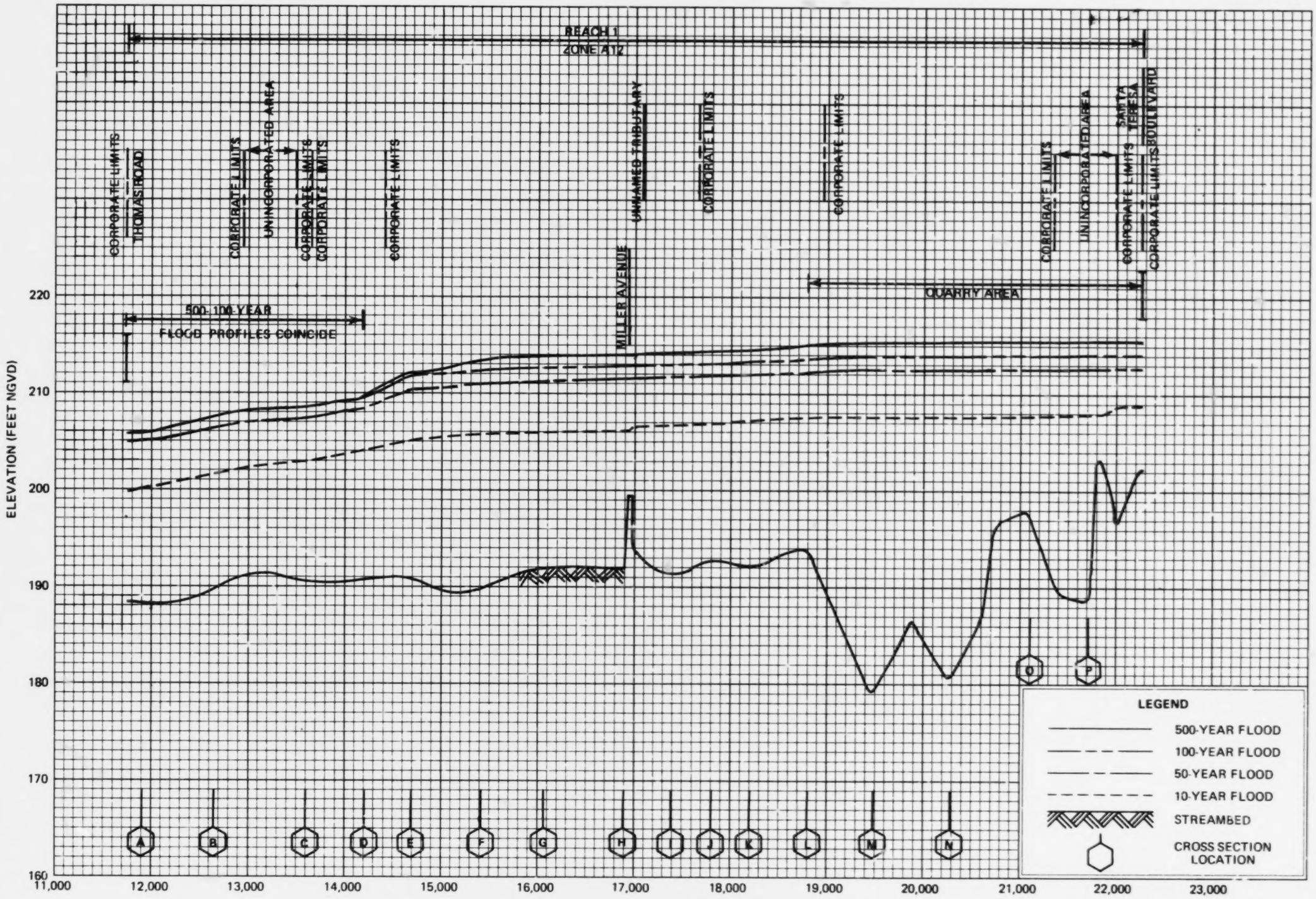

FLOOD PROFILES

UVAS CREEK

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(SANTA CLARA CO.)

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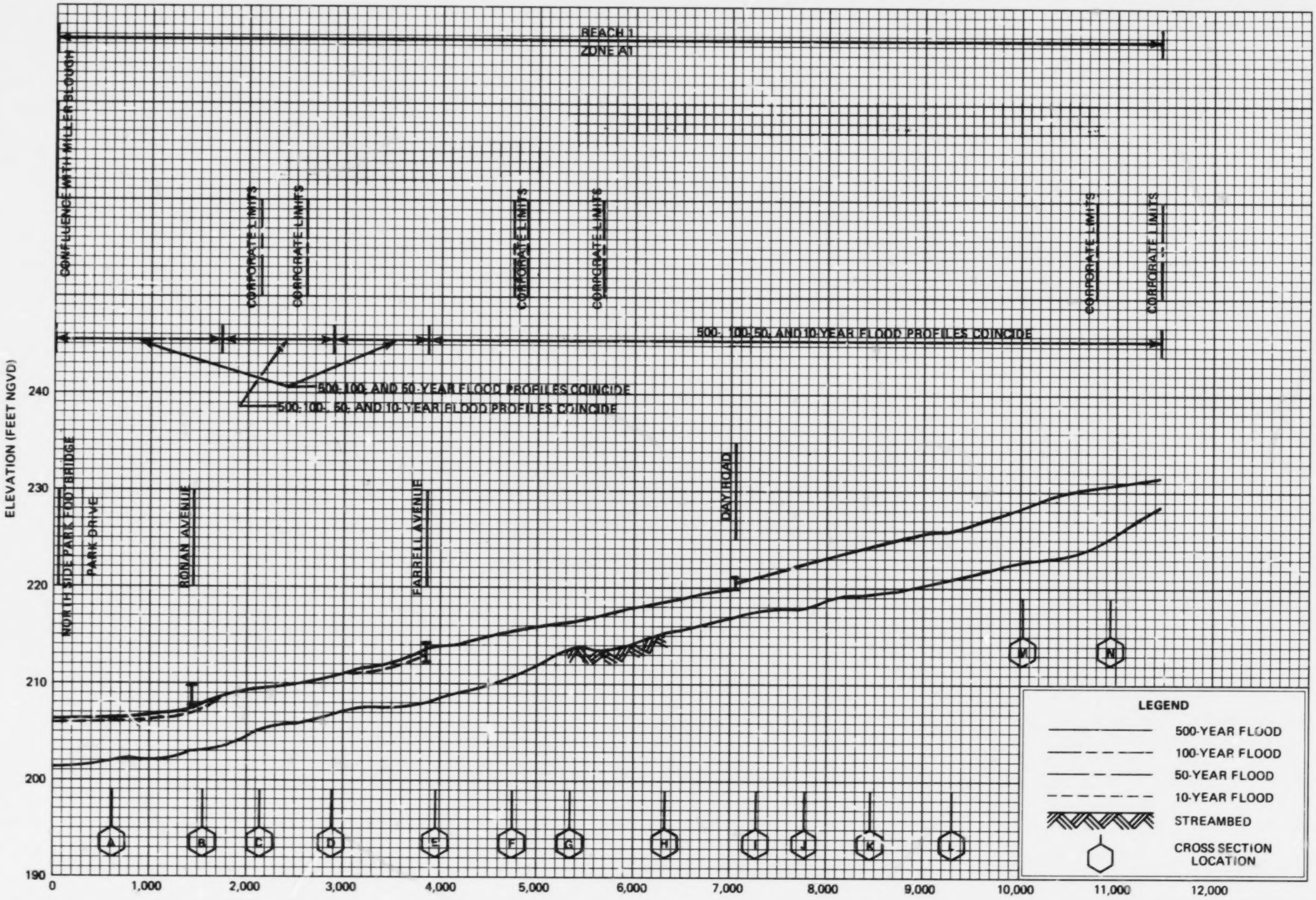

FLOOD PROFILES

WEST BRANCH LLAGAS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF GILROY, CA
(SANTA CLARA CO.)

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